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EXAMINER	
KANG, ROBERT N	

ART UNIT	PAPER NUMBER
2622	

DATE MAILED: 08/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/987,530	SHIBATA ET AL.	
	Examiner	Art Unit	
	Robert N. Kang	2622	RNK

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-26 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-26 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 17 November 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

TWYLER LAMB
PRIMARY EXAMINER

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 6, 10, 18, and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The aforementioned claims repeatedly make reference to a "cation dye" used as the secondary color mixture and an "anion dye" used as the primary colors. This claim is non-enabling. Since cations are commonly associated with acids, it is unclear why on pages 31-32 of the specification, the CMYK ink formulas utilize acidic, direct, and food dyes, whereas the P (secondary mixture ink) utilizes a basic dye. Furthermore, no motivation is given within the specification for this design decision. Further description of the cation/anion relationship with regards to the various color materials is required within the specification.

4. Claims 2, 12, and 26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims state the process comprises a step of "causing the generated n-value print data of the secondary or higher mixture color to correspond to the m-value data." The specification gives no in-depth explanation of this step and furthermore does not clarify what the "levels" of the print image are. Examiner assumes the n and m levels correspond to the quantization levels of intensity allowed by the halftone pattern in an image forming apparatus. On pages 8 and 41 of the disclosure the applicant gives an example of generating n-level data by "binarizing the (m=256) value data, the secondary color data is once binarized to 1 or 0 data, the 1 and 0 data being made in one-to-one correspondence with 255 and 0." The applicant must clarify the aforementioned step with values of n wherein the correspondence is non-obvious. Examiner assumes image processing methodologies such as histogram shaping and thresholding are used to achieve this correspondence.

Additionally, claims 2, 12, and 26 claim a method of "generating a secondary or higher mixture color for predetermined two or more color hues among the plurality of print data." In regards to calculating the term P, the "printability improved ink," the disclosure is non-enabling. As stated in the disclosure on page 20, blue ink is utilized as the printability improved ink P, and "when the tonal level data of blue ink is to be generated, the weighting process is performed if the image color printed with blue is

shifted to cyan or magenta." The disclosure does not give specifics in the weighting process, its coefficients, or the determination of said coefficients. Detailed explanation is required.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. The term "higher" in claims 1, 2, 11, 12, 25, and 26 is a relative term which renders the claim indefinite. The term "higher mixture color" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Applicant must further limit the term "higher mixture color" by including the limitation of dependent claims 3, 7, 13, and 19 within the aforementioned independent claims.

7. Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term "secondary color" in claims 1, 2, 3, 7, 10, 11, 12, 13, 18, 19, 24, 25, and 26 is used by the claim to mean "an alternate mixture for P, the printability improved ink", while the accepted meaning is "colors not within the primary color space, typically red, green, and blue." The term is indefinite because the lengthy specification does not clearly redefine the term.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3, 4, 5, 11, 13, 14, 15, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Perumal (US-PAT 5917994).

With regards to claims 1, 11, and 25, Perumal discloses in claims 1 and 15 of the granted patent a method and apparatus, respectively "for printing a binary-dot simulation of a continuous-tone color image," thereby "minimizing contrast between dots on the sheet and adjacent areas and so providing a better simulation of a continuous-tone image." Perumal discloses in column 7, lines 2-7 a Hue-Plus-Grey color space, wherein each color vector consists of "a black component, a white component, a primary color component (cyan, magenta or yellow), and a secondary color component (red, green, or blue), any of which may have a zero value." Perumal also illustrates in Figure 3 the conversion of traditional RGB color planes to HPG color vectors; in step 120, "the secondary component (red, green or blue) of the color vector, is set to a value equal to the difference in value between the RGB component having the largest value and the RGB component having the middle value." Broadly defined, this mathematical process constitutes "generating the print data of a secondary or higher mixture color based on the data to be printed." Perumal does not specifically limit his calculation and

color replacement to a "predetermined two or more color hues;" however, because the HPG color vector is generated for every RGB color in the print image, it is understood that the secondary color generation functions for combinations of one, two, or three color hues, and thus, broadly defined, encompasses the stated claim limitation.

Perumal also describes in claim 1, limitation 2, that the method comprises "replacing a quantity of a relatively dark color in the multilevel color representation with an equal quantity of each of plural relatively light colors, to form a new multilevel color representation." Although Perumal discloses in claim 4 that "the relatively light color replaced in the iteration is a subtractive secondary," his specification discloses in column 9, lines 37-28, that "secondary colors are replaced by certain levels of themselves and their primary components." Thus a secondary color mixture is used for replacement. These claims are congruous with the disclosed claim 1 limitation 2, which requires that the original print data be "replaced at least partially with the print data of the secondary or higher mixture color." Therefore all limitations of claim 1 are met. Since Perumal's disclosed method expressly anticipates the disclosed method in the pending application, it is obvious that claim 25, the aforementioned method maintained on a computer readable medium, is also anticipated by Perumal.

Specifically regarding claim 11, Perumal discloses in figure 1 a printer engine 24 of an inkjet printer utilizing the "process color" CMYK color set as described in column 2 lines, 41-64. Each of the primary colors, cyan, magenta, yellow, and black utilize its own ink as standardized in the inkjet printing industry; these inks are "color materials."

This print engine 24 qualifies as a "means for printing each color by using a plurality of different color materials based on the print data."

Regarding the second limitation of claim 11, Perumal describes in figure 1 a host processor 10 which includes a CPU 12 which communicates through I/O module 18 that "enables data flow to a connected printer 20. Printer 20 includes a CPU 22 and a print engine 24, both of which act to provide binary dot pattern color images." Therefore the CPU 12 and the I/O module 18 comprise a "data supplying means" which supplies the data obtained from the result of the aforementioned RGB to HPG calculation, which acts as the "secondary mixture color data generating process," to the printer.

Regarding claims 3 and 13, Perumal discloses in claim 3 a method as disclosed above wherein "the replacing step includes one iteration, replacing a quantity of relatively light color with plural quantities of even lighter colors to form the new multilevel color representation." Although Perumal discloses in claim 4 that "the relatively light color replaced in the iteration is a subtractive secondary," his specification discloses in column 9, lines 37-28, that "secondary colors are replaced by certain levels of themselves." Thus a secondary color or higher mixture color is used for replacement. Therefore the recited claims 3 and 13, "wherein a lightness of a print image by a color material of the secondary or higher mixture color is higher than a lightness of a print image by color materials of the predetermined two or more color hues," is met by the method and apparatus patented by Perumal.

In regards to claims 4 and 14, Perumal discloses in column 9 lines 36-40 a method of replacing black and primary colors in a print image wherein "black is replaced

with certain levels of cyan, magenta, yellow and black, and secondary colors (i.e., red, green blue) are replaced by certain levels of themselves and their primary components). Perumal also states in column 2, lines 54-57, that in the CYMK color space, "cyan and magenta combine to form blue, cyan and yellow to form green, magenta and yellow to form red, and all three to form black." Therefore, broadly defined, "the predetermined two or more color hues for replacement are two color hues among the three primary colors (CMY) for color printing." Thus claims 4 and 14 are anticipated by Perumal.

With regards to claims 5 and 15, Perumal discloses in column 11, lines 37, that "the invention has been described with respect to a color ink jet printer." Since it is self evident that an inkjet printer uses ink as its color material, claims 5 and 15 are anticipated by Perumal.

10. Claims 2, 7, 8, 9, 12, 19, 20, 21, 22, 23, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Slade (US-PAT 5982993).

With regards to claims 2 and 12, Slade discloses both a method as well as an apparatus for "color replacement using an extended ink set in a color printing system." Slade describes in figure 1 a printer 10 attached to a host computer 11, wherein, as stated in column 5, lines 7-10, "R, G, and B color signals which are generated, for instance by the personal computer 11, are directed to a three dimensional look up table 50 which converts the R, G, B signals to cyan, magenta, and yellow colorant signals." This CMY colorant signal constitutes the "original predetermined two or more color hues among the plurality of print data" as stated in claims 2 and 12. Slade also discloses in

column 5, lines 32-35, a color replacement device 52 that "generates a larger number of colorant signals in response to the C, M, and Y signals." The color replacement device 52 "includes a mechanism to convert a single colorant signal having a single hue and a saturation with two colorant signals, each having the same hue but at different saturation." This is congruous with the recited claim limitation of generating "print data of a secondary or higher mixture color." Slade also discloses in column 5, lines 36 to 41, the "color replacement device performs a one or more color undercolor removal strategy to replace, for instance, none, some, or all of the regular cyan with a lightcyan according to the cyan comparator." Because undercolor removal, as well defined in the industry, involves a subtraction of certain colorants by replacement with another colorant, the undercolor removal as disclosed by Slade qualifies as generating secondary print data "by subtracting the corresponded m-value data of the secondary or higher mixture color from the m-value data for the predetermined two or more color hues." Regarding the quantization of intensity levels in the print data, Slade states in column 6, lines 65- 69, that the patented invention's halftoner "might generate signals having multiple levels less than the original number of levels input thereto but greater than two for printing by a printer 10 which might print multiple drops of ink per pixel or location which might print drops of varying sizes." Therefore, the pending application and Slade's patent are both capable to generate n-level secondary data based upon the original m-level print data and are thus functionally identical.

With regards to claim 26, because Slade's disclosed method expressly anticipates the disclosed method in the pending application, it is obvious that claim 26,

the aforementioned method maintained on a computer readable medium, is anticipated by Slade as well.

Regarding claims 7 and 19, Slade discloses in column 3, lines 64-68 "an extended ink set includes more than one ink of the same or similar hue but having different saturations. The ink containers include, regular cyan ink, light cyan ink, regular magenta ink, light magenta ink." Therefore the "lightness of a print image by a color material of the secondary or higher mixture color is higher than a lightness of a print image by color materials of the predetermined two or more color hues."

In regards to claims 8 and 20, the "predetermined two or more color hues" which are used for generating the secondary color are seen clearly entering the color replacement unit 52 on the left side of figure 2. The labels for each signal, Cx, Yx, and Mx, correspond to the primary printing colors cyan, yellow, and magenta. Therefore the color hues are "among three primary colors for color printing."

Regarding claims 9 and 21, Slade discloses a thermal color inkjet printer 10 in column 3 line 63, wherein "printer 10 includes an extended ink set having six inkjet ink containers 14, 15, 16, 17, 18, and 19." Therefore the color material of Slade's printer is ink.

With regards to claim 22, Slade discloses in column 4, lines 17-20, a print head 26, which "contains a plurality of ink channels which carry ink from one or more of the ink containers 14-19 to respect ink ejecting orifices or nozzles of the printhead." Additionally, Slade describes an alternate configuration in column 4, lines 36, in which "each of the ink containers are connected to or include an individual linear nozzle array

such that the printer includes six linear arrays, one for each ink." Therefore the claim which requires "a head for each of the plurality of color materials for printing by discharging ink," is clearly met by Slade's patent.

Regarding claim 23, Slade discloses in column 1, lines 21-30 "a thermal ink jet printer, [where] the power pulses are usually produced by resistors, which are individually addressable to heat and vaporize ink in the channels. As voltage is applied across a selected resistor, a vapor bubble grows in the associated channel and initially bulges from the channel orifice followed by collapse of the bubble. The ink within the channel then retracts and separates from the bulging ink." Therefore the printer patented by Slade possesses a print head "wherein the head forms a bubble in the ink by using heat energy and discharges the ink by a pressure of the bubble."

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perumal (US-PAT 5917994) in view of Nagai (US-PAT 5882390).

With regards to claims 1, 11, and 25, Perumal discloses in claims 1 and 15 of the granted patent a method and apparatus, respectively "for printing a binary-dot simulation of a continuous-tone color image," thereby "minimizing contrast between dots on the sheet and adjacent areas and so providing a better simulation of a continuous-tone image." Perumal discloses in column 7, lines 2-7 a Hue-Plus-Grey color space, wherein each color vector consists of "a black component, a white component, a primary color component (cyan, magenta or yellow), and a secondary color component (red, green, or blue), any of which may have a zero value." Perumal also illustrates in Figure 3 the conversion of traditional RGB color planes to HPG color vectors; in step 120, "the secondary component (red, green or blue) of the color vector, is set to a value equal to the difference in value between the RGB component having the largest value and the RGB component having the middle value." Broadly defined, this mathematical process constitutes "generating the print data of a secondary or higher mixture color based on the data to be printed." Perumal does not specifically limit his calculation and color replacement to a "predetermined two or more color hues;" however, because the HPG color vector is generated for every RGB color in the print image, it is understood

that the secondary color generation functions for combinations of one, two, or three color hues, and thus encompasses the stated claim limitation.

Perumal also describes in claim 1, limitation 2, that the method comprises "replacing a quantity of a relatively dark color in the multilevel color representation with an equal quantity of each of plural relatively light colors, to form a new multilevel color representation." Although Perumal discloses in claim 4 that "the relatively light color replaced in the iteration is a subtractive secondary," his specification discloses in column 9, lines 37-28, that "secondary colors are replaced by certain levels of themselves and their primary components." Thus a secondary color mixture is used for replacement. These claims are congruous with the disclosed claim 1 limitation 2, which requires that the original print data be "replaced at least partially with the print data of the secondary or higher mixture color." Therefore all limitations of claim 1 are met. Since Perumal's disclosed method expressly anticipates the disclosed method in the pending application, it is obvious that claim 25, the aforementioned method maintained on a computer readable medium, is also anticipated by Perumal.

Specifically regarding claim 11, Perumal discloses in figure 1 a printer engine 24 of an inkjet printer utilizing the "process color" CMYK color set as described in column 2 lines, 41-64. Each of the primary colors, cyan, magenta, yellow, and black utilize its own ink as standardized in the inkjet printing industry; these inks are "color materials." This print engine 24 qualifies as a "means for printing each color by using a plurality of different color materials based on the print data."

Regarding the second limitation of claim 11, Perumal describes in figure 1 a host processor 10 which includes a CPU 12 which communicates through I/O module 18 that "enables data flow to a connected printer 20. Printer 20 includes a CPU 22 and a print engine 24, both of which act to provide binary dot pattern color images." Therefore the CPU 12 and the I/O module 18 comprise a "data supplying means" which supplies the data obtained from the result of the aforementioned RGB to HPG calculation, which acts as the "secondary mixture color data generating process," to the printer.

Regarding claims 3 and 13, Perumal discloses in claim 3 a method as disclosed above wherein "the replacing step includes one iteration, replacing a quantity of relatively light color with plural quantities of even lighter colors to form the new multilevel color representation." Although Perumal discloses in claim 4 that "the relatively light color replaced in the iteration is a subtractive secondary," his specification discloses in column 9, lines 37-28, that "secondary colors are replaced by certain levels of themselves." Thus a secondary color or higher mixture color is used for replacement. Therefore the recited claims 3 and 13, "wherein a lightness of a print image by a color material of the secondary or higher mixture color is higher than a lightness of a print image by color materials of the predetermined two or more color hues," is met by the method and apparatus patented by Perumal.

With regards to claims 5 and 15, Perumal discloses in column 11, lines 37, that "the invention has been described with respect to a color ink jet printer." Since it is self evident that an inkjet printer uses ink as its color material, depending claims 5 and 15 are anticipated by Perumal.

Perumal does not expressly state that his printing method utilizes color materials (ink) wherein the "secondary color mixture" is a cation dye and all others are anion dyes.

Nagai in column 21, lines 3-45 discloses a plurality of water-soluble dyes, including acid, direct, food, and basic. Nagai states in column 21, line 45, "of the above-mentioned water-soluble dyes, the acid dye... [is] particularly preferable."

Perumal and Nagai are combinable because they are both from the field of inkjet printing.

At the time of the invention, it would have been obvious to a person of normal skill in the art to utilize acid based (cation) dyes to create the secondary mixture of replacing the secondary colors in the print image with lighter secondary colors and their primary elements in Perumal's system as taught by Nagai.

The motivation for this modification would be to maintain a preferable water soluble dye as taught by Nagai. Note that since there was no motivation given in the disclosure for the claimed inventions, the examiner asserts that any non-obvious motivation is valid in the present rejection.

Therefore, it would have been obvious to combine Perumal with Nagai to obtain the invention claimed in claims 6 and 18.

14. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perumal (US-PAT 5917994) in view of Imanaka (US-PAT 6616257).

With regards to depending claim 11, Perumal discloses in claims 1 and 15 of the granted patent a method and apparatus, respectively "for printing a binary-dot simulation of a continuous-tone color image," thereby "minimizing contrast between dots on the sheet and adjacent areas and so providing a better simulation of a continuous-tone image." Perumal discloses in column 7, lines 2-7 a Hue-Plus-Grey color space, wherein each color vector consists of "a black component, a white component, a primary color component (cyan, magenta or yellow), and a secondary color component (red, green, or blue), any of which may have a zero value." Perumal also illustrates in Figure 3 the conversion of traditional RGB color planes to HPG color vectors; in step 120, "the secondary component (red, green or blue) of the color vector, is set to a value equal to the difference in value between the RGB component having the largest value and the RGB component having the middle value." Broadly defined, this mathematical process constitutes "generating the print data of a secondary or higher mixture color based on the data to be printed." Perumal does not specifically limit his calculation and color replacement to a "predetermined two or more color hues;" however, because the HPG color vector is generated for every RGB color in the print image, it is understood that the secondary color generation functions for combinations of one, two, or three color hues, and thus encompasses the stated claim limitation.

Perumal also describes in claim 1, limitation 2, that the method comprises "replacing a quantity of a relatively dark color in the multilevel color representation with an equal quantity of each of plural relatively light colors, to form a new multilevel color representation." Although Perumal discloses in claim 4 that "the relatively light color

replaced in the iteration is a subtractive secondary," his specification discloses in column 9, lines 37-28, that "secondary colors are replaced by certain levels of themselves and their primary components." Thus a secondary color mixture is used for replacement. These claims are congruous with the disclosed claim 1 limitation 2, which requires that the original print data be "replaced at least partially with the print data of the secondary or higher mixture color." Therefore all limitations of claim 1 are met. Since Perumal's disclosed method expressly anticipates the disclosed method in the pending application, it is obvious that claim 25, the aforementioned method maintained on a computer readable medium, is also anticipated by Perumal.

Specifically regarding claim 11, Perumal discloses in figure 1 a printer engine 24 of an inkjet printer utilizing the "process color" CMYK color set as described in column 2 lines, 41-64. Each of the primary colors, cyan, magenta, yellow, and black utilize its own ink as standardized in the inkjet printing industry; these inks are "color materials." This print engine 24 qualifies as a "means for printing each color by using a plurality of different color materials based on the print data."

Regarding the second limitation of claim 11, Perumal describes in figure 1 a host processor 10 which includes a CPU 12 which communicates through I/O module 18 that "enables data flow to a connected printer 20. Printer 20 includes a CPU 22 and a print engine 24, both of which act to provide binary dot pattern color images." Therefore the CPU 12 and the I/O module 18 comprise a "data supplying means" which supplies the data obtained from the result of the aforementioned RGB to HPG calculation, which acts

as the "secondary mixture color data generating process," to the printer. Thus Perumal's patented apparatus meets all the conditions of the depending claim 11.

Regarding claim 16, Perumal does not expressly describe a printer "wherein said printing means includes a head for each of the plurality of color materials for printing by discharging ink."

Imanaka describes in figure 16 a printing head unit 12, comprised of a head controller 170 and individual print heads 12, each distributing a specific color ink (C, M, Y, or K) through individual color nozzles.

Perumal and Imanaka are combinable because they are both from the field of inkjet printing.

It would have been obvious at the time of invention for one of normal skill in the art to include in Perumal's inkjet printing method a multiple head ink dispensing apparatus as disclosed by Imanaka and various other well-established examples of color inkjet printing.

The motivation for this modification would be to allow a single head controller 170 as shown in figure 17 to actuate all the color ink nozzles in the printing apparatus, thus saving time and costs.

Therefore it would have been obvious to combine Perumal with Imanaka to obtain the invention claimed in claim 16.

With regards to claim 17, Perumal does not expressly disclose a printer "wherein the head forms a bubble in the ink by using heat energy and discharges the ink by a pressure of the bubble."

Imanaka claims a color inkjet printing method in paragraph 7, wherein "thermal energy is made to act upon ink and the ink is jetted by utilizing the pressure produced by thermal expansion." Additionally, Imanka states in paragraph 17 that the mechanism controls "the volume of an ink bubble depending upon the temperature of the heating element 901 and the temperature of the surroundings, a pulse (a preheating pulse) whose energy is not high enough to jet ink is applied before the heating pulse that causes the jetting of the ink, then the temperature of the heating element 901 and of its surroundings is adjusted by changing the pulse width and output timing of the preheating pulse to thereby discharge ink droplets in a constant amount."

Perumal and Imanaka are combinable because they are both from the field of inkjet printing.

It would have been obvious at the time of invention for one of normal skill in the art to include in Perumal's inkjet printing method a method of dispensing ink from a print head nozzle through thermal energy as taught by Imanaka and other well-established examples within the art.

This method is advantageous in that the response to a printing signal is good and it is easy to group the discharge ports together at a high density; additionally the high precision in controlling the volume of ink results in consistent image forming.

Therefore it would have been obvious to combine Perumal with Imanaka to obtain the invention claimed in claim 17.

15. Claims 10 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Slade (US-PAT 5982993) in view of Nagai (US-PAT 5882390).

With regards to depending claims 2 and 12, Slade discloses both a method as well as an apparatus for "color replacement using an extended ink set in a color printing system." Slade describes in figure 1 a printer 10 attached to a host computer 11, wherein, as stated in column 5, lines 7-10, "R, G, and B color signals which are generated, for instance by the personal computer 11, are directed to a three dimensional look up table 50 which converts the R, G, B signals to cyan, magenta, and yellow colorant signals." This CMY colorant signal constitutes the "original predetermined two or more color hues among the plurality of print data" as stated in claims 2 and 12. Slade also discloses in column 5, lines 32-35, a color replacement device 52 that "generates a larger number of colorant signals in response to the C, M, and Y signals." The color replacement device 52 "includes a mechanism to convert a single colorant signal having a single hue and a saturation with two colorant signals, each having the same hue but at different saturation." This is congruous with the recited claim limitation of generating "print data of a secondary or higher mixture color." Slade also discloses in column 5, lines 36 to 41, the "color replacement device performs a one or more color undercolor removal strategy to replace, for instance, none, some, or all of the regular cyan with a lightcyan according to the cyan comparator." Because undercolor removal, as well defined in the industry, involves a subtraction of certain colorants by replacement with another colorant, the undercolor removal as disclosed by Slade qualifies as generating secondary print data "by subtracting the corresponded m-

value data of the secondary or higher mixture color from the m-value data for the predetermined two or more color hues." Regarding the quantization of intensity levels in the print data, Slade states in column 6, lines 65- 69, that the patented invention's halftoner "might generate signals having multiple levels less than the original number of levels input thereto but greater than two for printing by a printer 10 which might print multiple drops of ink per pixel or location which might print drops of varying sizes." Therefore, the pending application and Slade's patent are both capable to generate n-level secondary data based upon the original m-level print data and are thus functionally identical. Therefore the depending claims 2 and 12 are expressly anticipated by Slade.

Slade does not expressly state that his printing method utilizes color materials (ink) wherein the "secondary color mixture" is a cation dye and all others are anion dyes.

Nagai in column 21, lines 3-45 discloses a plurality of water-soluble dyes, including acid, direct, food, and basic. Nagai states in column 21, line 45, "of the above-mentioned water-soluble dyes, the acid dye... [is] particularly preferable."

Slade and Nagai are combinable because they are both from the field of inkjet printing.

At the time of the invention, it would have been obvious to a person of normal skill in the art to utilize acid based (cation) dyes to create the secondary mixture of replacing the secondary colors in the print image with lighter secondary colors and their primary elements in Slade's system as taught by Nagai.

The motivation for this modification would be to maintain a preferable water-soluble dye as taught by Nagai. Note that since there was no motivation given in the disclosure for the claimed inventions, the examiner asserts that any non-obvious motivation is valid in the present rejection.

Therefore, it would have been obvious to combine Slade with Nagai to obtain the invention claimed in claims 10 and 24.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Klassen (US-PAT 6268939) discloses a method for correcting the luminance and chominance data in digital color images. Itoh (US-PAT 6803932) describes a 6 color printing method utilizing undercolor removal through calculation of a secondary color mixture in color laserjet printers. Macholdt (US-PAT 6406528) discloses a method and use of improved (lighter) cyan pigments in inkjet inks.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert N. Kang whose telephone number is (571) 272-0593. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Coles can be reached on (571)272-7402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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